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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/821,751	04/08/2004	Jeremie James Dalton	101.114	1874
7590	06/15/2005		EXAMINER	
Thomas Swenson 1118 13th Street, A-5 Boulder, CO 80302			YEVSIKOV, VICTOR V	
			ART UNIT	PAPER NUMBER
			2891	

DATE MAILED: 06/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/821,751

Applicant(s)

DALTON ET AL.

Examiner

Victor V. Yevsikov

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 April 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-18, 20-22 and 31-41 is/are rejected.
- 7) ☒ Claim(s) 5, 19 and 23-30 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>4/04 7/14/04, 7/22/04</u> | 6) <input type="checkbox"/> Other: _____ |

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4, 10-11, 14-18, 33, 34 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal et al. (US 6,365,486 B1) in view of Huang et al. (US 6,146,941).

Agarwal teaches a method wherein:

providing a substrate 10 having an untreated dielectric layer 16:

the untreated dielectric layer does not comprise metal atoms;

the untreated dielectric layer comprises a silicon containing dielectric compounds;

the untreated dielectric layer comprises a material selected from the group consisting of SiO₂, SiN and other;

the exposing the dielectric layer to the excited iodine species is conducted at low pressure;

providing an iodine-containing precursor gas or surfactant species (col.5, lines 1-23);

generating a plasma discharge to create excited iodine species from the iodine-containing precursor gas;

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exposing the dielectric layer to the excited iodine species to form a plasma-treated dielectric layer.

Reference: figs 1A-1C; cols 4-5, lines 33-23.

Agarwal teaches the features out lined above, but does not show exactly a method wherein the depositing a ruthenium thin film on the plasma-treated dielectric layer using a CVD and technique.

However, Huang teaches a method the depositing a ruthenium thin film 218 or 220 on the plasma-treated dielectric layer 216 or 220 (which making by APCVD or sputtering under the influence of plasma) using a CVD technique (figs. 1E-1H and 2A-2F with corresponding text).

Also, with respect to claims 10 and 11 Huang teaches a method for Ru thin film deposition wherein thin film containing ruthenium atoms or ruthenium oxide (col. 6, lines 16-22 and claims 14,23).

Consequently, it would have been obvious to one of ordinary skill in the art to apply method of Agarwal to obtain dielectric substrate treatment and ruthenium layer as taught by Agarwal/Huang.

Claims 6,7,12, 20-22 and 35 rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal et al. (US 6,365,486 B1) and in view of Pyo (US 6,593,236 B2) cited by applicant.

Agarwal teaches the features out lined above, but does not show exactly a method wherein the iodine-containing precursor gas comprises molecules selected from the group consisting of C_2H_5I , and other organic iodines, including I_2 .

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However, Pyo teaches a method wherein the iodine-containing precursor gas comprises molecules selected from the group consisting of C_2H_5I , and other organic iodines, including I_2 (col. 2, lines 40-55; claims 7-10).

Therefore, it would have been obvious to one of ordinary skill in the art to use C_2H_5I , and other organic iodines, including I_2 as iodine-containing precursor gas as taught by Agarwal/Poy.

Claims 8-9,31,32 rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal /Huang and in view of Vaartstra et al. (US 6,074,945).

Agarwal/ Huang teaches the features out lined above, but does not show exactly a method wherein the depositing a ruthenium thin film comprises using a MOCVD or an ALD technique.

However, Vaartstra et al. (US 6,074,945) teaches a method wherein the depositing a ruthenium thin film comprises using a MOCVD or an ALD technique (col.5, lines 54-62; col.6, lines 27-51).

Therefore, it would have been obvious to one of ordinary skill in the art to use the MOCVD or the ALD technique as taught by Agarwal/ Huang/ Vaartstra.

Claims 13, 36, 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal /Huang and in view of Lane et al. (US 6,812,143 B2)

Agarwal/ Huang teaches the features out lined above, but does not show exactly a method wherein the depositing the ultra-thin ruthenium film having a thickness in a range of about from 1 nm to 20 nm.

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However, Lane teaches a method wherein the depositing the ultra-thin ruthenium film having a thickness in a range of about from 1 nm to 40 nm (col. 9, lines 63-64).

Therefore, it would have been obvious to one of ordinary skill in the art to deposit Ru film with thickness as taught by Agarwal/ Huang/ Lane.

Claims 37-39 rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal /Huang and in view of Vaartstra et al. (US 6,074,945).

Agarwal/ Huang teaches the features out lined above, but does not show exactly a method wherein the depositing a second metal layer on ruthenium thin film.

However, Vaartstra et al. (US 6,074,945) teaches a method wherein the depositing a second metal layer (copper) on the ruthenium thin film (col.6, lines 6-18).

Therefore, it would have been obvious to one of ordinary skill in the art to use the second metal layer as taught by Agarwal/ Huang/ Vaartstra.

Claims objected

Claims 5, 19 and 23-30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor Yevsikov whose telephone number is (571) 272-1910. The examiner can normally be reached on Monday –Thursdays 8:00-5:30.

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If attempts to reach the examiner by telephone are unsuccessful, examiner's supervisor, William B. Baumeister, can be reached on (571) 272-1722. The fax phone numbers for the organization where this application or processing is assigned is (703) 873-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR. Status information for unpublished application is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Victor Yevsikov
Examiner
Art Unit 2891

June 3, 2005



B. WILLIAM BAUMEISTER
SUPERVISORY PATENT EXAMINER